Mansoura University Faculty of Engineering		Department: Computers Engineering And Systems Total Marks: 50 Marks	BME Program MTE Program

Course Title: Database System	Course Code: CSE 451	Level 400
Date: Jan, 2019 (First term)	Allowed time: 2 hrs	No. of Pages: (2)

Remarks: (Answer the following questions... assume any missing data)

Question No. (1) (18 Marks)

Q1-A) What Is meant by the term Data , give an example (2 Marks)

Q1-B) What Is a Database System? Then state its components for each write a short note?

Q1-C) Define the relation between the following terms:

DDL and DML **(DB manager, DB server, DB Engine, DBMS)**
Data and Meta Data **SQL and SQL server**
Integrity and integration **Key and Index** (2 Marks)

Q1-D) Specify why Records in a DB file may be variable length? (How to unify) (2 Marks)

Q1-E) Explain how A relational database management system (RDBMS) do the following?

I- Provide mechanisms to help protect the integrity of the data.

II-Ensure that relational schema are in at least 3NF. (2 Marks)

Q1-F) For any relational database table, the set of attributes in the table must be sufficient to produce at least: ___ Domain Column, _____ primary key(s) and____ foreign key(s), at least – tuple, at least ---- column, at most ---- column (2 Marks)

Q1-G) A relation with two attributes A and B satisfies the functional dependency A → B. Then the functional dependency B →A also holds in the relation. (is this valid!) (2 Marks)

Q1-H) A relation R has attributes A, B, and C. Fill in the blank so that the query returns each tuple in R exactly once. SELECT * FROM R ----------; (2 Marks)

Q1 -I) Assume that we have two relations, M, and N

(i) The relation MN is resulted from Joining M with N which of the following expression is right (write the correct answer)

- Cardinality of MN ≤ Cardinality of M ||Cardinality of N
- Degree of MN ≥ Degree of M && Degree of N

(ii) Repeat (i) while the relation MN is resulted from Union M with N (3 Marks)

Question No. (2) (18 Marks)

Q2-A) **[10 points]** Define what is meant by Normalization, Is the following Relation is not in the normal form, apply normalization steps to convert it in normal form: assuming the following assumption

PK = C_id + P_num	**c_id + p_num ⟶ r_start, r_end**
c_id ⟶ c_name	**p_num ⟶ p_address, city, state, zip, rent, owner_num, owner**

c_id	p_num	c_name	p_address	city	state	zip	r_start	r_end	rent	owner_num	owner
01	pr3 pr22	Jane Doe	123 Elm St 246 Pine St	Ely Elko	NV NV	11111 11112	1-1-96 2-1-98	12-1-98 3-30-00	785 1200	po23 po44	Ike Jones Jan Perez
02	pr17	Fred Fish	321 Oak St	Ely	NV	11111	2-1-88	1-11-90	1080	po32	Jill Ames
03	pr32 pr22	Ed Smith	511 2nd St 246 Pine St	Ely Elko	NV NV	11111 11112	6-1-90 4-1-00	3-1-95 Present	950 1400	po32 po44	Jill Ames Jan Perez

Q2 -B) Consider the following schema for an airline database (primary key attributes are in **bold**):

FLIGHTS (**flight_num**, source_city, destination_city)
DEPARTURES (**flight_num, date,** plane_type)
PASSENGERS (**passenger_id**, passenger_name, passenger_address)
BOOKINGS(**passenger_id, flight_num, date**, seat_number)

Write RA expression statements to :

(I) Find the cities that have direct (non-stop) flights to both Honolulu and Newark. (II) Find the passenger_name of all passengers who have a seat booked on at least one plane of **every** type.
(III) Find the flight_num and date of all flights for which there are no reservations. Write SQL expression statements to :
(I) Find the cities that have direct (non-stop) flights to both ALX and Cairo
(II) Find the passenger_id of all passengers who have a seat booked on a plane of type ``747" from San Francisco to Washington. **Do not return any duplicate values. (III))** Find the passenger_name of all passengers who have a seat booked on at least one plane of **every** type.

Question No. (3) (21 Marks)

Q3-A) Use the following relational schema for writing the SQL statements which help in the next queries: Car (vehicle_id, make, license_plateNo, max_numb_passengers, max_speed, price) - Truck(vehicle_id, make, license_plateNo, numb_axles, tonnage, price)- Employee(first_name, last_name, SSN, birthdate, address, jobtype)- Drives(SSN, vehicle_id) - PartType(typeid, description)- Part(part_num, typeid, vehicle_id) **(8 Marks)**

1. Find employees (first_name, last_name, SSN) who drive the fastest car in the database
2. Delete employees driving only trucks that have tonnages at least 3 tons.
3. List cars (vehicle_id) that has been driven by the all employees
4. List vehicle_id and price for trucks that have in them "windshield wipers model 345" and price less than $50000
5. Insert a new record (assume any data suitable for the Employee table).

Q3-B) (7 Marks) Design an E/R diagram describing the following domain: • A Person has attributes pid (key) and name. • A Skier is a type of Person with attribute aptitude. • A Snowboarder is a type of Skier. • A PairOfSkis has attribute sid (key) and model. • A Snowboard has attribute sid (key) and model. • A Skier owns zero or more PairOfSkis. The ownership relation has a purchase price. A PairOfSkis is owned by at most one Skier. • A Snowboarder owns zero or more Snowboards. The ownership relation has a purchase price. A Snowboard is owned by at most one Snowboarder. • a Person can rent a PairOfSkis or a Snowboard. A person cannot rent more than one PairOfSkis or one Snowboard at the same time. A person cannot rent a PairOfSkis and a Snowboard at the same time either. A piece of equipment can be rented by at most one person at a time. The rental comes with a start date and an end date. **Then** Write the SQL CREATE TABLE statement for the owns relation between Skier and PairOfSkis. Make sure that your statement specifies the PRIMARY KEY and any FOREIGN KEYS. Additionally, we would like to enforce the constraint that purchase price be greater than zero

Q3-C) Consider the following E-R diagram pertaining to a retail chain that sells watches in airport locations.
List the tables that implement this diagram. Use the table notation:
TableName(attr1,attr2, attr3, ….), and underline the primary key for each.
(6 Marks)